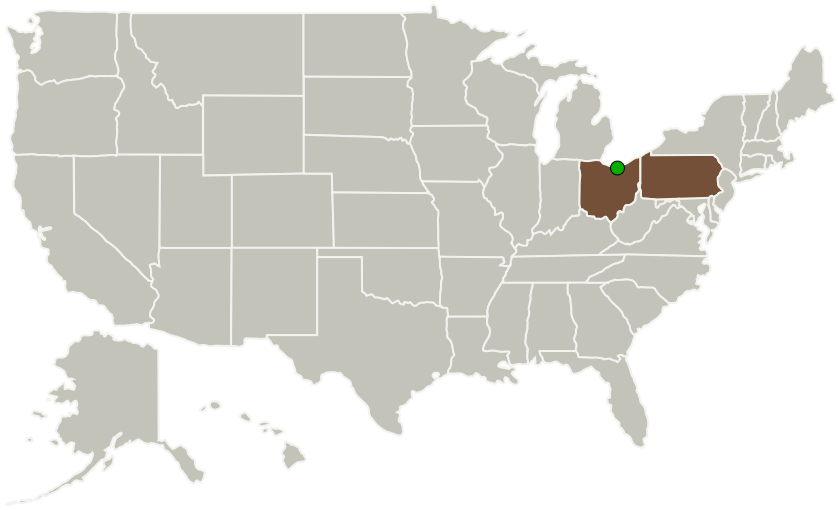
Innovative High Temperature Heat Pipes for Spacecraft Nuclear Fission Systems, Phase II

Completed Technology Project (2013 - 2016)

Project Introduction

NASA Glenn is examining small fission reactors for future space transportation and surface power applications. The reactors would have an 8 to 15 year design life and should be available for a 2020 launch to support future NASA science missions. Both 1 kWe thermoelectric and 3 kWe Stirling systems have been examined. Heat pipes are being examined to transfer the thermal energy from the reactor to the electric conversion systems. There are three types of wicks that can carry this power over the distance; grooved, sintered arterial and self-venting arterial. Arterial heat pipes are the default design for spacecraft nuclear reactors; however, de-priming of the artery due to radiation is a serious potential problem. Grooved and self-venting arterial heat pipes are less susceptible to de-priming since the liquid in the grooves is open to the vapor space and the self-venting arterial heat pipe has venting pores in the evaporator to allow trapped vapor to escape. ACT's innovation was to examine the tradeoffs between the three heat pipe wicks and determine an optimum wick design that is suitable for fission reactor applications. The Phase I project was successful in demonstrating that all three types of wicks can transport the necessary power.

Primary U.S. Work Locations and Key Partners



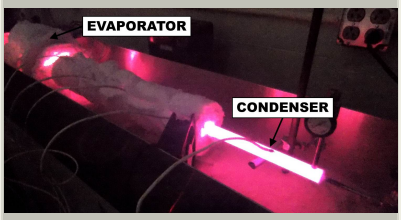


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Table of Contents

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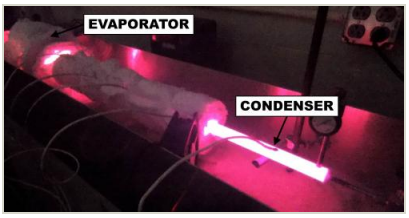
Organizations Performing Work	Role	Type	Location
Advanced Cooling Technologies, Inc.	Lead Organization	Industry	Lancaster, Pennsylvania
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Pennsylvania

Images



Briefing Chart Image
Innovative High Temperature Heat Pipes for Spacecraft Nuclear Fission Systems, Phase II
(https://techport.nasa.gov/image/130951)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Advanced Cooling Technologies, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Calin Tarau

Co-Investigator:
Calin Tarau

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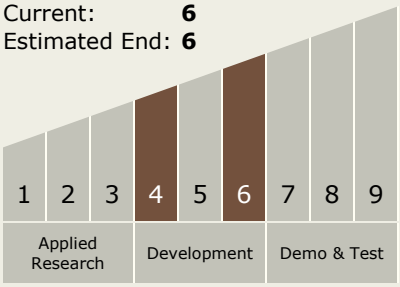
Completed Technology Project (2013 - 2016)

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.4 Dynamic Energy Conversion

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System